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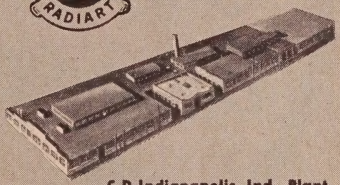

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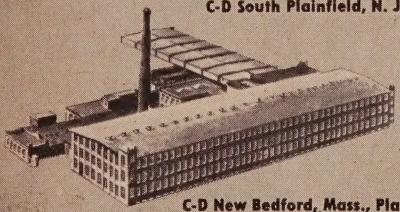

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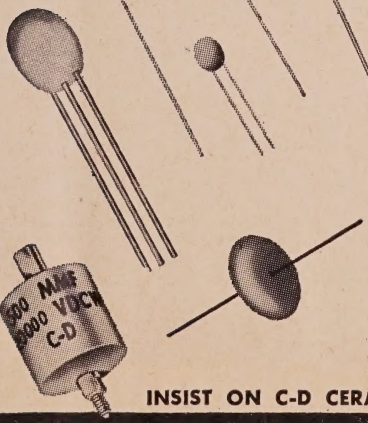

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SIGNAL GENERATOR IMPEDANCE MATCHING

Receiver sensitivity is measured in terms of the r. f. input-signal amplitude which will produce a given output-signal amplitude The input signal is expressed in microvolts, absolute or referred. The essential instrument for this test is a signal generator with a microvolt-calibrated output attenuator. The same instrument and techniques are employed in checking receiver sensitivity and in measuring the transmission characteristics of networks, such as r. f. filters, transformers, etc.

The importance of matching the signal generator output circuit to the input circuit of the device under test often has been ignored in the past by service technicians and some laboratorians. However, television and other high-frequency receivers now in common use point up the necessity for close matching if attenuator accuracy is to be maintained. Correct connection of the signal generator is extremely important in TV front-end alignment. Because this subject apparently has been neglected in some quarters, it seems appropriate at this time to discuss signal generator impedance matching. The reader is advised to check the ratings and specifications of his own signal generator and to determine how closely normal use of that instrument comes to complying with recommended operation as outlined in this article.

Basic Rules

The basic theorem of generator and load relationships, from elementary electrical engineering, is that the load impedance must be equal to the generator impedance for maximum power transfer.

The basic relationship of a generator and load is illustrated in Figure 1. This applies to any case, whether electronic or electrical, ac or dc. The generator is a source of voltage, E_g, having an internal impedance (usually resistive) Z_g. It is connected to a load impedance, Z_L, through which a current I is forced and across which a voltage E_L is developed.

Current I flowing through Z_g, the internal impedance of the generator, produces a voltage drop IZ_g across this impedance. It also produces a voltage

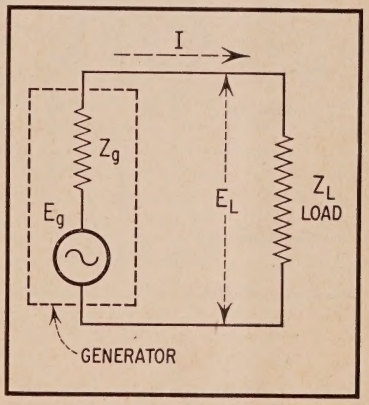

Fig. 1. Basic Relationship of Generator and Load.

drop $IZ_L = E_L$ across load impedance Z_L. The current flowing in the circuit is equal to $E/(Z_g + Z_L)$, assuming resistive impedances in which phase relationships can be ignored.

From these relationships, it is clear that Z_g must be small if maximum voltage is to be developed across Z_L. Power delivered to the load impedance

varies as the square of the voltage, thus:

$$(1) \quad P = I^2 Z_L = \frac{Z_L E_g^2}{(Z_g + Z_L)^2}$$

From this equation, it is seen that when Z_L is variable and Z_g fixed, the power is maximum when Z_g is zero, and approaches zero for very high and very low values of Z_L. Maximum power is delivered to the load when $Z_L = Z_g$. Under these conditions, E_L is $\frac{1}{2}E_g$.

When $Z_L = Z_g$, the maximum power supplied to the load is:

$$(2) \quad P = \frac{E_g^2}{4Z_g}$$

This shows that the load receives one-half of the generated power and that one-half is consumed in the generator. Thus, the condition of $Z_g = Z_L$ is correct for maximum transfer of energy but represents only 50% efficiency.

Signal Generator Coupling

The principles discussed in the preceding paragraphs now may be applied with understanding to the signal generator coupled to an external load such as a receiver.

The conventional output system employed in modern signal generators with resistive output is illustrated by

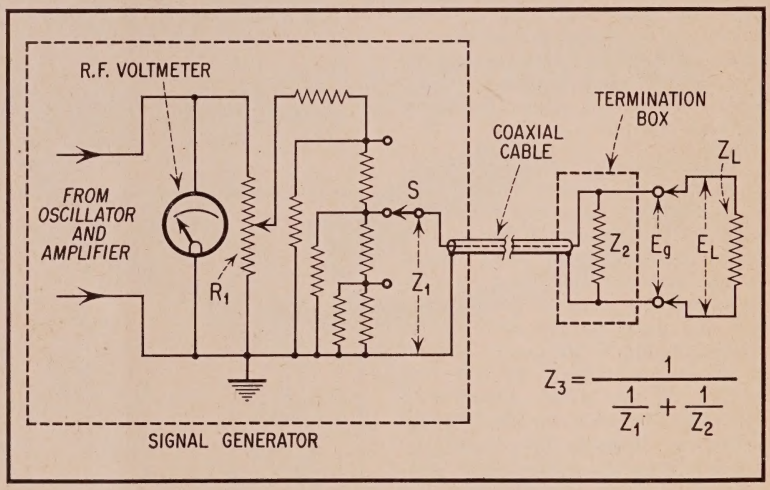

Fig. 2. Signal Generator Output Circuit.

Figure 2. Following the oscillator-amplifier circuit is an adjustable resistance-type attenuator, consisting of a continuously variable section (R_1) and a step-type multiplier (S). An r. f. voltmeter monitors the input to the attenuator system. This r. f. input is adjusted to a predetermined reference amplitude by means of a rheostat or potentiometer in the amplifier section of the generator, whereupon the microvolt readings of R_1 and S will be correct.

In order to maintain the shortest

possible leads between the signal generator and the load device, a **termination box** is provided. The latter is attached to the end of a coaxial cable and contains the terminating resistance Z_2 and a pair of terminals, across which the open-circuit output voltage E_g is developed, which are connected to the external load device, Z_L.

The output impedance of the signal generator proper at the point of connection to the cable is Z_1 and is the output impedance of the step-type attenuator. The output impedance of the entire generator system, of course, is equal to Z_1 and Z_2 in parallel, which we will designate Z_3. Since the coaxial cable is a transmission line, it must be terminated correctly, this being the purpose of Z_1 at one end and Z_2 at the other. For proper termination, $Z_1 = Z_2$ and the output impedance of the instrument becomes $Z_2/2$.

From the discussion of the basic principles of matching in the first part of this article, it is clear that the voltage (E_L) developed across the load (Z_L), which may be a receiver input circuit, equals generator output voltage E_g whenever Z_L is much larger than Z_2. Whenever Z_L is equal to Z_1 and Z_2 in parallel or very nearly so, E_L is lower than E_g. The value of the voltage developed across Z_L under any conditions may be determined from the equation:

$$(3) \quad E_L = \frac{E_g Z_L}{Z_3 + Z_L}$$

From this equation, it is seen that E_L is one-half of the open-circuit voltage E_g when Z_L is exactly equal to Z_3, or is equal to $\frac{1}{2}Z_2$. Thus, the signal voltage actually developed at the input terminals of a receiver having an impedance of $\frac{1}{2}Z_2$ is only one-half of the open-circuit voltage which would be present at Z_1 if Z_2 were removed. The attenuator in the signal generator sometimes is calibrated to read true voltage E_g when Z_2 is terminated by $Z_L = Z_g$. These facts point up the importance of matching the receiver or other circuit under test to the specified signal generator output impedance if the output microvoltage indications are to be relied upon. When such matching cannot be carried out, the microvolt readings must be corrected by means of Equation (3).

The use of simple non-inductive resistors as dummy antennas between a signal generator and receiver having an input impedance higher than that of the generator is shown in Figure 3. In Figure 3(A), the circuit is shown for working into a receiver with unbalanced (one-side-grounded) input. Here, the resistance of the single resistor is equal in ohms to the difference between the receiver and generator impedances, the generator being assumed to be terminated correctly by a cable termination box. A receiver having balanced input will require two non-inductive resistors (See Figure 3B), each equal to one-half the difference between receiver and terminated-generator impedances. The latter connection may be used with conventional television receivers having 300 or 150-ohm balanced input.

Frequency Considerations

Aside from the inaccuracies in output microvoltage indications, which arise from a mismatch between a signal generator and load, frequency effects also must be taken into account.

The instrument output impedance varies with frequency when Z_1 and Z_2 (Figure 2) are unequal. The effect becomes more pronounced and troublesome as the frequency increases and

the length of the coaxial cable approaches a quarter wavelength. In the extreme case, the signal voltage becomes zero at the output end of the cable. When $Z_1 = Z_2$ (resulting in an output impedance of $Z_2/2$), frequency effects are negligible.

For reasons of frequency-dependent reactance, only non-inductive resistors are to be used in pads or dummy antennas following a radio-frequency signal generator. Carbon or composition components usually will be entirely satisfactory for this purpose. Wirewound resistors of the so-called "non-inductive" construction should not be used unless they are known definitely to have been designed especially for v. h. f. operation. Resistors in this category, which have been manufactured primarily for instrument applications at low frequencies, possess a small amount of inductance which will give considerable reactance at frequencies employed in television and high-frequency communications.

At very high operating frequencies, it often is advantageous to employ a coupling transformer or a balun between the generator and receiver, instead of the simple 2-resistor scheme shown in Figure 3(B). Transformers

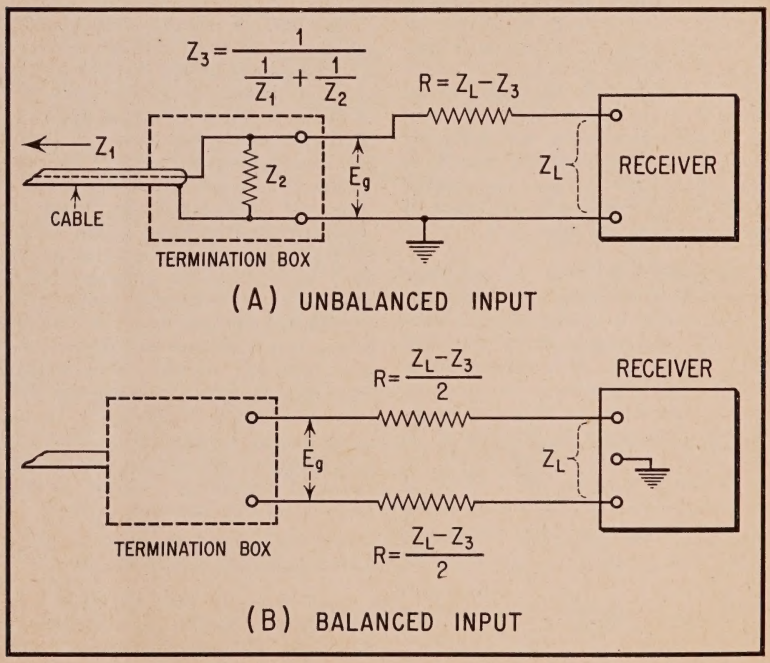

Fig. 3. Resistor-Type Dummy Antennas.

and baluns are effective for the conversion from unbalanced generator output to balanced receiver input.

Adapting Unterminated Generators

Some signal generators, especially those in the service category, are provided with output cables but without end-termination boxes. The impedance of such a cable usually is stated by the manufacturer of the generator, and the cable is terminated at the generator end in its characteristic impedance. Common impedance values of such cables are 50, 53, 73, and 75 ohms.

A satisfactory end termination may be constructed by the user, according to the scheme shown in Figure 2. The non-inductive resistor Z_2, which must be provided, has the same ohmic value as that of the cable impedance and of the generator-end termination Z_1. The builder must remember, however, that when the terminating resistor is added, the output impedance of the signal generator system (at the terminal-box terminals) becomes ½ of the value originally specified for the unterminated signal generator.

The unterminated cable may be connected directly to an unbalanced load, such as the antenna input terminals of a grounded-single-ended input of a receiver, without difficulty when the load impedance (receiver input impedance) corresponds to the cable characteristic impedance. Thus, a 75-ohm cable may be connected directly to a 75-ohm input. But, connection to a higher or lower-impedance load or to a receiver with balanced input requires the insertion of matching resistors, as shown in Figure 3.

These remarks apply especially to TV sweep generators, most of which have low-impedance cable outputs with no terminations at the cable ends.

Most TV sweep generators do not deliver a high-amplitude signal voltage. This means that there is no reserve available to waste in matching resistors. It becomes a problem then to match an unterminated cable to the higher-impedance receiver input when checking sensitivity or aligning the front end of a TV receiver. This problem will become still more acute in the u. h. f. television where frequency effects will be felt more severely.

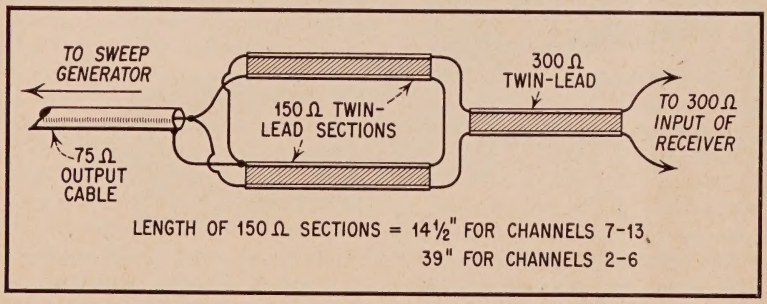
TO SWEEP GENERATOR
75 Ω OUTPUT CABLE
150 Ω TWIN-LEAD SECTIONS
300 Ω TWIN-LEAD
TO 300 Ω INPUT OF RECEIVER
LENGTH OF 150 Ω SECTIONS = 14½" FOR CHANNELS 7-13,
39" FOR CHANNELS 2-6

Fig. 4. Matching Section for 75 - 300 Ohms.

Figure 4 shows a scheme recommended by Sylvania[1] for matching an unterminated 75-ohm sweep generator cable to the 300-ohm input of a TV receiver. Here, the matching section is made from two lengths of 150-ohm twin lead. To reduce intercoupling, the two sections of twin lead are separated by at least 5 inches, and all leads must be kept as short as practicable.

D. C. Isolation and Grounds

The discussion up to this point has concerned primarily the application of a test signal to the antenna input terminals of a receiver. Other points of signal injection are the grid or plate terminals in video or i. f. amplifiers, r. f. amplifiers, 2nd detectors, limiters, wavetraps, etc. In most of these cases, impedance matching is of smaller consequence since the load impedance is several times higher than the generator impedance.

Other precautions need attention, however. One important one is d. c. isolation of the generator output. Whether the generator is terminated or not, the output terminals usually are bridged by a resistor and no coupling capacitor is provided. The system thus is not blocked for d. c. This means that the output resistor can be damaged if the signal output terminals are connected between B + and ground in the receiver. This happens very easily when injecting a signal into an i. f. transformer primary. The generator resistor also can short-circuit the grid resistor when a signal is fed into the grid-to-ground circuit. The remedy is to attach a small mica or ceramic capacitor to the high output terminal, using the shortest possible pigtails. Values between 0.0005 and 0.001 ufd. are satisfactory for conventional television frequencies.

A second important matter is that of signal generator output ground connection. Malfunction, due to secondary loops, usually results from running a separate ground wire from the receiver to a ground terminal on the signal generator case. Correct practice is to take the signal ground directly from the end of the generator cable or termination box. Also, connect this ground as close as possible to the part of the circuit to which the high signal lead is connected.

Operation of the test setup is enhanced when, **in addition to the foregoing precautions regarding grounding,** a common ground is run between the receiver, signal generator, and output indicator (meter or oscilloscope). This common bond should consist of a heavy wire run between the instruments and receiver and then to a good earth ground. In stationary installations, such as a permanent shop or laboratory, a sheet copper bench top is provided for this same purpose. Each instrument and the receiver under test is grounded to this sheet (which in turn is grounded to earth) by means of a flat sheet-metal tab attached to the sheet. Observance of the grounding rules will eliminate many of the failures of the output control in the generator to control signal strength properly even when impedances obviously are matched.

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[1]Wm. P. Mueller, "Sylvania News," February, 1951, p. 7.

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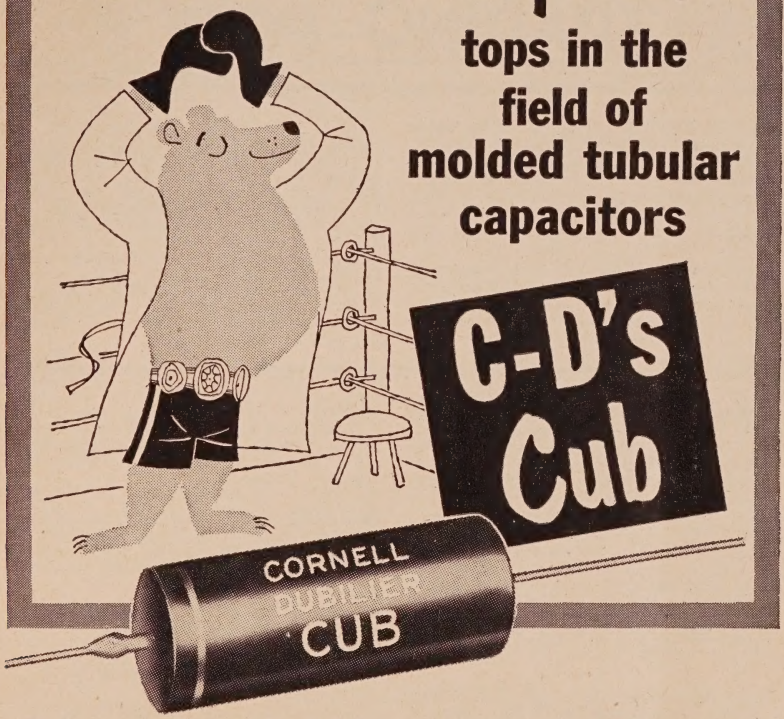

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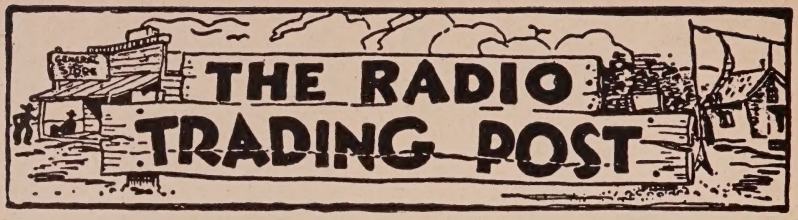

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SWAP — Riders PA manual, Sprague Telohmike 16, EMC tube tester, all tubes, roll chart. Want old Million test gear, Philco test gear, comm. receiver, Heath 05 scope. M. Orange, Westbury, N. Y.

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SWAP — HRO-M receiver, rack mount, power supply and 1.7 to 3.5 and 3.5 to 7 Mc. coils for tape recorder. A. Glozer, 1630 South Cuyler Ave., Berwyn, Ill.

FOR SALE — Used TV sets, three 7" and three 10", all need some work. Local purchaser, $60 for all. Ken Niles, 4505 North Kenneth, Chicago 30, Ill.

SELL OR TRADE — 40 220 v. AC, 60-cycle S.P.D.T. heavy-duty relays; also Ranco type O refrigeration temperature controls. Need radio parts, what have you? Harry Niccum, 6514 Aldama St., Los Angeles 42, Calif.

FOR SALE — NRI transmitter complete, wired and operating; 30 w. phone and CW; 40 w. modulator with mike; 80- and 20-meter plug-in coils, $50. Isaac Moadus, 3 Ohio Ave. Ext., McDonald, Ohio.

FOR SALE — Hallicrafter S-82 civic patrol receiver, l. n., $40 prepaid. Al Werhan, Manlius, N. Y.

FOR SALE — TV, radio, phono service store, ideal location, near bus stops, shopping center. Small apartment and driveway for parking and auto service. Paragon TV and Radio Service, 170 - 26 Jamaica Ave., Jamaica 32, L. I., N. Y.

FOR SALE — TV and radio service shop. Established seven years. Write or see Fred's Radio Clinic, 732 - 14th St., Paso Robles, Calif.

FOR SALE — Sound power phones, $6; Geiger Counter with battery and phones, $20; 1953 model Heath sig. gen., $20. Walter Smith, R. 2, Charlotte, Mich.

FOR SALE — Sutco UHF converter-booster, $20; Alliance BB2 booster, $12. Herr's Radio Service, Paradise, Pa.

SELL OR SWAP — Accoustic and electric operatic and classical records in exc. cond. Sam Block, 646 Argyle Road, Brooklyn 30, N. Y.

FOR SALE — Obsolete tubes: three RCA Radiotron UX226, Arcturus 71A, Airline 227, Cunningham CX326. Make offer. T. A. McDonald, 2682 Tremainsville Rd., Toledo 13, Ohio.

WANTED — Late NRI radio and TV manuals. S. Winterfeld, 1044 Boynton Ave., Box 72, New York, N. Y.

FOR SALE — Triplett model 630 volt-ohm meter in A-1 operating cond., used one year, $27.50. Samuel W. Lister, 176 Redstone Park, Huntsville, Ala.

FOR SALE — Two 1/4 HP 12 v. motors; Ballentine dynamotor; PE 103-A power unit. Grant LaMaye, 1864D, Apt. 4, Buffalo Rd., Erie, Pa.

TRADE — BC-312N Army receiver in very good cond., for comm. or homebuilt 50 w. Xmitter. CW and Phone-in cabinet. Local only. Emile Chuprinko, 1101 Rostraver St., Monessen, Pa.

SELL OR SWAP — Airex 630FA TV receiver with latest 6BK7 cascode tuner, molded capacitors, 21EP4 pix tube. Like new, factory assembled, less cabinet, $180 or swap equiv. in electronic or scientific equip. Gerald Sweet, Box 324, Rome, N. Y.

FOR SALE — 49 Radio Craft magazines from 1934 to 1947 (incomplete), mostly good cond.; also 5 Service magazines from 1934 to 1941, all for $7. William Landfield, 2140 Daly Ave., Bronx 60, N. Y.

FOR SALE — NC-57 receiver, very good cond., $60; BC-221 AK freq. meter, A-1 cond., $85. Millen Exciter 90811 10 meter coils with 832 tube, $20. Ed Taffe, Jr., 222 - 3rd St., Palisades Park, N. J.

WANTED — VHF, TV antennas for fringe area reception. Prefer for channels 3-6, and 10. What have you? Robert C. Gelnett, R. 2, Liverpool, Pa.

WANTED — Tape recorder, Eicor model 15 or better. Also field strength meter 10 - 50 Mc. Laurence G. Cowles, 5420 Brae Burn Drive, Bellaire, Tex.

SELL OR TRADE — Auto radios: '47 Chevrolet, '41 Pontiac; Eico 360 sweep gen., 325 scope without case, EMC VTVM Capacitor. All A-1 cond. Want '49 Studebaker auto radio. Joseph Niedzielski, 558 Ralph Ave., Brooklyn, N. Y.

TRADE — Hickok Mutual Dynamic tube tester AC-52 with latest chart, for comm. receiver or ham gear. Louis A. Josephson, 313 N. McLean St., Bloomington, Ill.

FOR SALE — Output Trans. Peerless S-532-A push-pull, 5,000 and 3,000 pri. imd. (C.T.), 4 sec. imped. 20 w., l. n., $6. L. Matushefske, 2 Elmont Rd., Elmont, L. I.

FOR SALE — GE AM-FM sig. gen., YGS-3, $60; GE 3" scope, $25; GE Capacitance-Resistance bridge, $20, all like new. Meissner Analyst, $30, used slightly. Seymour Tenzer, 138 Dahill Dr., Brooklyn 18, N. Y.

FOR SALE — Test equip., receiving tubes, pair 6 v. auto horns, etc. Send for list. Lowe E. Smith, R. 1, Silver Creek, Ga.

SELL OR TRADE — Heathkit TV alignment gen., TS-2, perf. cond., $40, for Webster 126/127 record player or Hi-Fi gear. P. J. Deery, 44 Crestview Ave., Springdale, Conn.

FOR SALE — Radio receiver BC-348-M, serial 315, made by Stromberg Carlson Tel. Mfg. Co. Best offer. E. H. Hart, 12 Blackhawk Rd., Scarsdale, N. Y.

FOR SALE — Garrard RC-60/L16 automatic record changer, with or without portable carrying case, cost $85. Best offer. Bob Brunker, 252 Watertown St., Newton 58, Mass.

TRADE — Portable PA system, complete, $50; HB Cond. tester and sig. tracer, $20; Philco 78 changer, $12.50; U. S. A. F. helmet, earphones, mike and oxygen tube, $10; Sperti sun lamp, $15. What have you? Bob Robinson, 612 Charlotte St., Utica, N. Y.

SELL OR TRADE — Superior sig. gen., $20; amp; record changer; radio - record changer combination. Want radio tubes, books, magazines, equipment, TV, etc. Grant's Radio Service, R. 3, Box 3, Coalgate, Okla.

FOR SALE — Sylvania 216 sig. gen., $75; Nos. 1 to 168 Sams Photofacts, $125, all cash. William P. Henninger, Elizabethville, Pa.

FOR SALE — Channel 17 UHF Standard strips, UHF converters. Ben's Radio, No. Tonawanda 2, N. Y.

FOR SALE — SX71 and speaker, $200; HT18 VFO, $75; HFS and power supply, $125; ARC5 and tubes 6 v. and 522 transmitter less tubes $25. John A. Schwerbel, 111 W. Hoffman Ave., Lindenhurst, N. Y.

FOR SALE — Equip. for complete radio shop: 600 l. n. tubes, Riders manuals 1 to 16, test equip., speakers, Xfmrs., coils, resistors, condensers, many other misc. items. $650 if taken as a unit. Stuert E. Erickson, Rt. 4, Box 518C, Charlotte, N. C.

WANTED — No. 805 McMurdo Silver, 100 Kc., I.F. transformer, must be factory model. Charles H. Connor, 712 North Dearborn St., Chicago 10, Ill.

WANTED — PE103 and brushes, Vibropacks, Variac-0-130 selsyns and voltage. W. Bartels, 5638 Abbottsford Ave., Cincinnati 13, Ohio.

SELL OR SWAP — Fifty transformers and chokes; 30 oil-filled condensers; 40 transmitting tubes; 2 vacuum condensers; 6 v. dynamotor; 35 mm. camera, projector and screen; meters, misc. items. Want R'9er. D. L. Hansen, Box 273, Coleraine, Minn.

WANTED — Hammarlund HQ 129-X rcvr., or Hallicrafter S-38, also, auto license plates any state, province or country, any year. Bob Ward, Box 214-A, Schwenksville, Pa.

FOR SALE — Precision tube tester 912, $35; Remington Elec. Add machine, $195; RCA FM-AM radio 8X71, $29. Frank Miller, R. 5, Towanda, Pa.

SWAP — Eicor dynamotor, 12 v. - 550 v. power supply for Collins 32 RB transmitter, for 110 v. power supply for use with Collins 32 RA model 8 transmitter, AC. All inquiries answered. Wesley W. Brogan, 306 Bethlehem Pike, Ambler, Pa.

WANT TO RENT — Books on radio servicing by Rider, Ghirardi, Rufus P. Turner, or Supreme Radio Publications. Will return same in exc. cond. Wayne Sines, R. 1, Box 362, Oakland, Md.

WILL TRADE — Like new radial type ground ball bearings, sizes on request. Need Rider Vol. 15 or what have you. Nelson Frieberg, 302 Eastwood Ave., Ithaca, N. Y.

FOR SALE — Hi-Fi equip.: James Lansing D-130 speaker (latest); Craftsman C10 tuner and 500 amp.; Altec "Voice of the Theatre" assembly: 515 woofer, 802 tweeter and crossover, H-808 horn. All l. n., will sacrifice. Rev. Philip LiCalzi, Greenwich, N. J.

FOR SALE — Radio Products Co. VTVM, model 668, never used, sacrifice, $60, prepaid. Agostino, 223 S. Winebiddle Ave., Pittsburgh 24, Pa.

SELL OR TRADE — Radio - TV Electronics correspondence course with kits. Ford radio ('49-'50) l. n. Louis Matejzel, 2245 W. Farragut, Chicago 25, Ill.

FOR SALE — 9-1065 Meissner radio-phono-recorder, complete, $55; 10-11 and 6 meter converter, $20; Gardner-Levering tape puller and punch, $4. Prices FOB. All inquiries answered. George Kirk, 417 College, Kent, Ohio.

FOR SALE — Monitoradio AR2 aircraft receiver, used one month, in original carton, $25; l. n. ATR inverter type 6LID, $14. Henry Becker, 5218 South Monitor Ave., Chicago 38, Ill.

FOR SALE — Disbanding TV-FM library. Send stamped self addressed envelope for list of books all in exc. cond. at approx. half of original cost. Marcus H. Moses, 35 Hamilton Place, New York 31, N. Y.

FOR SALE — Cascade combination radio-phono (33⅓, 78), disc (up to 10") recorder, portable case, mike; Jackson 640 test osc., 100 Kc. thru 34 Mc. Prices on request. Marvin Shapiro, 1240 Sherman Ave., 1A, Bronx 56, N. Y.

SWAP — A-1 Meissner model 8C FM tuner with cabinet for new Acrosound TO-300 output transformer. Diagram and instructions inc. George Novak, 5036 So. Kildare, Chicago 32, Ill.

FOR SALE — Emerson portable, Emerson CF, Silvertone 4501, Apex "8B" chassis, 4-band Grunow 750, all A-1, $9.50 each, FOB. Wanted: sig. gen., VOM, PA amp., .22 pistol, binoculars. Amorose Radio, Route 4, Richmond, Va.

FOR SALE — Weston model 798, proportional mutual conductance tube checker, hardly used, exc. for experimenters or Hi-Fi men, $80, or swap for latest Heath tube checker and TV sweep gen. Local only. Lester Strong, 2923 Wellman Ave., Bronx 61, N. Y.

FOR SALE — Apollo 16 mm. sound proj., used approx. 50 hours, 1000 ft. assorted film subjects, some spare parts, $100 for lot. Will consider best offer. Michael A. Novosel, 110 N. Gates Ave., Kingston, Pa.

SELL OR SWAP — Hickok Mut. Cond. 532 tube tester; Hickok 610-A sweep and marker gen. Both l. n., reasonable, will swap one unit for Sylvania 220 tube tester. Paul Tyrlick, Embden, N. D.

FOR SALE — Pilotuner model T601, and Edwards Fidelotuner 6 tubes. Both O.K., $10 each, FOB. J. L. Smith, 3508 Turkeyfoot Rd., Akron 19, Ohio.

FOR SALE — Complete CREI Radio Engineering correspondence course, excellent cond., best offer takes it. Also Shopsmith, complete with jigsaw, extra attachments $190. Free delivery within 1½ hours' drive, otherwise FOB. Simon Turniansky, 404 Bradford St., Brooklyn 7, N. Y.

FOR SALE — Wyse Arc-Melt Soldering unit 450 w., .7 to 5.4 amps, 3 ranges, 0-10 DC volts and 20 0-20 DC amps., Triplett model 327-T meters; Rider TV manuals 1 thru 3. George Kokish, Annandale, N. J.

SELL OR TRADE — Stromberg-Carlson chassis, model 925, 12" speaker, turntable aut. changes 78 RPM records, $25; Lansing Hi-Fi 12" speaker. Want diamond tipped cartridge with arm, record player 33 RPM. Ernest Mueller, 44 Carlton St., E. Orange, N. J.

FOR SALE — Superior cross bar gen., A-1 cond.; Heathkit TV gen., TS-2, with 3 holes in front panel where marker gen. was removed. Best offer over $20 each. V. A. MacRabie, Walton Rd., Franklin, N. Y.

WANTED — Late model tube tester such as Triplett 3423, have test instruments and TV booster for trade, plus cash. Virgil Franceschini, 708 Bigler Ave., Barnesboro, Pa.

FOR SALE — Riders 6, 9 to 12, 14, 15, 17 to 20, and TV volume No. 1, all l. n. W. B. Underwood, 203 Donald Ave., Rahway, N. J.

FOR SALE — Two GE V-3850 scopes; two Dumont 175A scopes, $40 each. Stanley Krzak, 65 Main St., Pawtucket, R. I.

SELL OR TRADE — Riders manuals 1 to 19 complete; Heathkit 0.7 5" scope; Simpson 351 TV ant. compass; Simpson 390 Volt Amp Wattmeter Appl. tester, all like new. Harry's Radio-TV, 309 S. Cicero, Chicago 44, Ill.

WANTED — 6 and 12 v. battery eliminator, wire or tape recorder, vibrator tester in trade for GE battery charger, Silver Sparx 905 sig. tracer, 7" RCA 621TS. G. Tannelli, 493 Warburton Avenue, Hastings-on-Hudson, N. Y.

WANTED — Radio & TV News, June, 1951 to July, '52; Radio-Electronics, Jan., 1950 to Sept., '52. Other radio magazines back to Jan., 1950. Send lists and prices. George H. Morse, Box 544 Drumheller, Alberta, Canada.

FOR SALE — Complete 250 w. phone rig, PP-T55 final, BC-459 and BC-696 drivers mounted in 5½' Bud CR 1772 rack, separate speech amp., in Bud CR 1741 cabinet. No TVI. Bob Reagan, 2407 Parkway Dr., Winston Salem, N. C.

TRADE — Heavy duty ¼" electric drill, key chuck, high speed grinder with 2 5" wheels, tracer, injector, made from schematic from C-D Capacitor, audio and I.F., for something usable in radio repair. George Ellwood, 518 Holmes Ave., Ontario, Calif.

WANTED — RCA 41903 Capacity Relay. State price and cond. Louis Kurkjian, 146 N. Ardmore Ave., Los Angeles 4, Calif.

WANTED — VFO, Viking or similar. Will trade typewriter or similar office machine. Will give to worthwhile local organization collection of radio tubes, radio books, other items. Please don't phone. G. Samkofsky, 527 Bedford Ave., Brooklyn 11, N. Y.

FOR SALE — Hi-Fi preamplifier, Approved, model A-800, $15; Webster-Chicago 127-56, 3-speed Hi-Fi auto changer with GE triple play cartridge $20, all FOB. Charles W. Leigh, 162 Passaic St., Trenton 8, N. J.

FOR SALE — 3 vols. Silvertone manuals, $8; Zenith manuals vols. 1 and 2, $5; portable Hartman and Brown 0-100 ammeter and 0-60 wattmeter, each $5; 5" square 0-250 MA panel mounting meter, $5; 3¼" round 0-06 panel mounting ammeter, $2. All postpaid. Albert Hart, 207 N. Raymond St., Griffith, Ind.

WANTED — Type 1SB6 tube in good operating cond. State price. Garry B. Richardson, 219 N. 22nd St., Murphysboro, Ill.

FOR SALE — Hickok 305 scope; Transvision 12½" table TV, separate FM band; Motorola 7" and Emerson 10" TV; Weston wattmeter 1500 watts. Denaro Radio, 24 Cleveland Ave., Waldwick, N. J.

SELL OR TRADE — Heath VTVM, V-4A; Feiler Stethoscope, TS-3A; Heath scope, 04; Jackson Condenser tester, 112; Golden Voice auto radio, M-800; 1 to 50 Sams Photofacts, Radio Clinic, 845 Allingham St., Van Wert, Ohio.

WANTED — Rider TV manuals 1 to 12. State cond. and price. Thomas Monzo, Box 15, So. Fallsburg, N. Y.

FOR SALE — 620-P Precision tube and set tester, instructions, speed roll tube chart, $75; Blonder-Tongue DA2-1-M Distribution amp. with instructions, $15, plus express charges. Both in exc. cond. W. L. Cope, RD 3, Salem, Ohio.

SELL OR TRADE — NRI Servicing course, multitester (converted to AC), radio (needs power Xformer), Hallicrafter 7" TV. Want printing outfit, wire, disc, or tape recorder, portable typewriter, or ?? Bruno DeCola, 379 S. Broadway, Salem, Ohio.

WANTED — Recording wire, cash. Hour spools preferred, .004" dia (old size), or .0036 (standard), new or in good cond. C. G. Herzog, 678 Russell St., New Haven 13, Conn.

SELL OR TRADE — Hickok 195B scope, $95; Telrad 18A frequency standard, $25; Weston 772 analyzer, $30. Want Simpson TV field strength indicator. Droke, 4113 Slater Ave., Baltimore 6, Md.

FOR SALE — Riders manuals 1 thru 14 in exc. cond., $100. Will ship packed in wooden cases. W. E. Anderson, 73 Brunswick Ave., Bloomsbury, N. J.

WANTED — Sprague TO-3 Tel-ohmike, Precision test apparatus and circuit diagram for Jewell pattern 199 volts milliamperes meter. W. E. Schwenzer, 3619 Peach St., Erie, Pa.

SELL OR TRADE — Presto K8 recorder, PA system, Analyst, Hickok 288X, McIntosh 40 w. amp. Need FM and/or AM tuner, transcription turntable, Hammond organ. Neal Page, 5924 Fairfax Ave. So., Minneapolis 10, Minn.

WANTED — Used ICS courses or misc. ICS lesson texts, any subject. G. Crapsi, 251 N. Ellicott St., Williamsville 21, N. Y.

WANTED — SX-28A or HQ-129X. Will pay cash or trade 6 x 9 Baltimore hand powered printing press, plus cash. Edward Bernash, 46 Hillside Ave., Woodlawn, Buffalo 19, N. Y.

SELL OR SWAP — Heathkit RF sig. gen., model SG-6, in good cond. Ken Bastian, Chilton, Wis.

FOR SALE — Pentron recorder 7½" ps, $40; twenty rolls new recording tape, $2 each; Wilcox-Gay recorder 2-speed, $75; 10 rolls erased 1200-ft. rolls of tape, $1.50 each. Dan Wolpin, 1208 First Ave., Columbus, Ga.

FOR SALE — 1941 Olds auto radio, $20. Will ship anywhere in U. S. Thomas Hansen, 3110 Eagle Pass Road, Louisville 13, Ky.

TRADE — 3 small used juke boxes, need adjustments, play 45 RPM's, cost $300, for good receiver and transmitter plus mobile setup including transmitter, converter and whip. Roy MacLeod, 222 Nahant St., Wakefield, Mass.

SELL OR TRADE — GE self-charging portable; pair 222 Walkie-Talkies; sig. tracer; sig. gen.; antenna rotator; ATR inverter; Zenith Universal 3-way portable. E. G. Bartlett, Atlanta, Mo.

SELL OR SWAP — Radio test equip., parts, books, for 2¼" x 3¼" camera accessories or darkroom equip., phonograph or recording machine. Best offer takes all. Bert Windreich, 19 East Van Cortlandt Ave., Bronx 68, N. Y.

SWAP — Keystone 16 mm. camera, model A-3, f3.5 lens; Keystone projector with regular and wide angle lens and case, for cash or working tape recorder. H. Wirth, 47-07 39th Ave., Long Island City 4, N. Y.

SELL OR TRADE — DeForest radio-TV course in binders, for $50; or typewriter in A-1 cond. Anderson, 2461 Elberon Ave., Cincinnati 4, Ohio.

FOR SALE — TV sweep gen., Heath TS-2, almost new, $22.50. E. B. Snow, 23 Chelmsford Rd., Rochester 18, N. Y.

FOR SALE — Feiler Electric Stethoscope, model TS-3, never used, $20; C-D condenser tester, BF-50, serial no. 10810, $25. Shear's Store, Radio Dept., Box 95, Bertie County, Woodville, N. C.

WANTED — Tone Control for Zenith 6-S-152 all wave (foreign, bass, normal, fidelity, voice) Part No. 85-92. Robert Bane, 219 Hillside Ave., Hillside, N. J.

FOR SALE — Used TV antennas: Channel 4, two Channel 7s, with harness, $4 ea. Camille Pichet, Jr., 98 Fourth St., Auburn, Me.

SELL OR TRADE — DeForest's Training Master course; Radio-Television Training Association course, both with all kits; Canadian TT-1 tube tester. Want test instruments in kits or built, or 3-speed record player. A. Atlas, c.p. 5 Uptown, Levis, Quebec. Canada.

SWAP OR SELL — Hammond Solovox, GE turntable 7833. Want Webcor tape recorder, multimeter, or ? Paulding, Barron Theatre, Pratt, Kan.

SWAP — Kodak Tourist II camera with Kodak Anaston f6.3 lens, Kodak flash-200 shutter No. 620 for wire recorder. Julio Cesar Calderon, 64 Manati St., Hato Rey, Puerto Rico.

SELL OR TRADE — Nuclear scaler, Atomic Instruments, model 101; Survey meters: Victoreen 356 beta-gamma $160; Victoreen 263 alpha $180. All exc. cond. Want Collins 75A2 or 75A3 receiver. P. M. Reyling, R. 2, Concord, Tenn.

FOR SALE — Hallicrafters S40B, make offer. Radio magazines and catalogs 1920-1930; model 89 Supreme tester, $20. Dictophone reproducer, $10. Gifford N. Hartwell, 38 Charlemont St., Newton Highlands, Mass.

TEST EQUIPMENT SERVICE — We repair and calibrate all types of test equip., from small multimeters to lab instruments. Missouri Electronics Corp., 6058 Maple Ave., St. Louis 12, Mo.

FOR SALE — BC-348 receiver, internal P.S., S meter, $60; 522, 2-meter transmitter, $15; Prop pitch motor, converted for 110, 60 cycle operation, $15; Vibroplex gold plated bug, $15. G. V. Metzger, 231 Garfield Ave., Collingswood, N. J.

WANTED — 7" or larger TV sets, TVG 2 sweep gen., picture tube tester, 8 mm. art films. Have: Shure 55A mike — A86A cable transformer, 805's, 810's, 1624's — RF, AC, DC, d.b. meters, RG58U, RG8U coax. Ace TV Co., Box 2945, Tampa, Fla.

WANTED — Condenser mikes, especially Western Electric 394-W series of early 30's. Incomplete or defective units considered, but want complete mike head in good cond. State cond. and price. J. F. Geilenkirchen, 14 Valley Rd., White Plains, N. Y.

SELL OR TRADE — Zenith FM radio model 7H918, good cond.; Riders manuals, 8 thru 12; Norelco Duo-Vue model PA-20 with screen 3 x 4. Want Precise Kit 3008K scope. Payad Radio and TV, 125 E. Main St., Staunton, Ill.

WANTED — PE-110 power supply or components for cash or will trade. Philip D. Greenway, 1740 North Ave. NW, Atlanta, Ga.

FOR SALE — Heath TS-2 sweep gen., factory calibrated, $25; Electronic Corp. of America AM gen., $25. Equipment complete with leads. Ideal for student or beginner. Both for $40. Vic's Radio and TV Service, 1961 Hunt Ave., Bronx, N. Y.

WANTED — Someone to build over a model 309 Dynoptimum tube tester for the testing of later tubes. Last chart we have is dated 7-17-40. Burcher's Electrical Store, Honesdale, Pa.

FOR SALE — Regency VMF Booster Channels 2 to 13 — separate inputs for 72 and 300 ohm lines, $7.50 FOB. Arthur Ideker, 1505 W. 14th, Pine Bluff, Ark.

SWAP — 1953 Sprayberry Radio-TV course, more than 70 lessons, including business builders, repair bulletins, less kits for portable typewriter. W. D. Berry, 7529 Kalamazoo Dr., Citrus Heights, Calif.

SELL — Meissner model EX signal shifter TVI'd, 80-40-20-15-10 meters, 6 w. output, $60. B. Green, 51 Elmira St., Hicksville, L. I., N. Y.

SELL — Boehme automatic keyer for Morse code, $95; 21A Teletype tape printer, $49; 7-B tape transmitter, $25; APA-10 Panadaptor, $125; APR-5A receiver, $125; No. 12 Teletype page printer with keyboard, $145. Tom Howard, 46 Mt. Vernon St., Boston 8, Mass.

SELL OR TRADE — Two late Holmes 35 mm. sound projectors with amp. and speaker Crown rotators and TV distribution systems for top TV test equip. George J. Ayoub, 1430 Wyoming St., El Paso, Tex.

FOR SALE — Trio Phaseitron TV antenna and control for channels 4 and 5, complete $25. Mark W. Ewald, 417 E. State St., Rockford, Ill.

WANTED — Mobile converter which shows 80-75, 40, 20, 15, 11-10 meters. Also model S38 Hallicrafter receiver. Give full details. Gregory C. Hologa, Winchester, Wis.

FOR SALE — Radio amateur transmitter 300 w., all bands 10-80, VFO, CW, NFM, 813 final. Includes power supply, $120. R. Pelton, 321 Carroll Ave., Mamaroneck, N. Y.

SELL OR SWAP — Radio and TV tubes, all good numbers, 1. n., for what have you? Bender Sales, Box 455, Sealy, Tex.

WANTED — Used radio transmitter parts and S40B Hallicrafter receiver. Will pay cash. Jose E. Mesorana, Radio KP40C, P.O. Box 602, Aguadilla, Puerto Rico.

FOR SALE — Unused latest model VOM, 1000 ohms per v., using 4" meters, housed in oak cabinets, complete with batteries and instructions. $12.95 postpaid. L. Cohn, 151 - 09 - 34th Ave., Flushing, N. Y.

WANTED — RTA-1B, BC-348, ARC-1, ART-13, Panadaptor, Keyboard tape perforator for Morse code, APN-9, BC-221, LM, Teletype, 32V-2, 75A-1, No. 10 Collins exciter. F. Minturn, Box 252, Boston 1, Mass.

FOR SALE — Wattmeter, GE type P-3, single-phase, 10 amp., 100-125 v., 1000 w., portable, walnut case, high accuracy,, precision built, durable, l. n., $100. Criss Kidder, Maple Lane, North Syracuse, N. Y.

SELL OR TRADE — Miscellaneous ham parts, including high voltage transmitting condensers (example — .00015 at 10 kv. type G); RCA 50 w. power, 8-tube sound amp. MI-4288. R. & M. Television, 284 Morris Ave., Elizabeth, N. J.

WANTED — Cameras, 4 x 5 or 35 mm. and accessories or HO gauge model railroad equip. Will swap amateur equip. or wire and tape recorders. D. Argentini, 9 Upland Park, Somerville, Mass.

SELL OR TRADE — W-C 80-1 wire recorder, $50; Jackson 615 multimeter, $7.50; Triplett 1200A multimeter $12.50; Solar Exameter model CF, needs line trans., $25; Perfex, f2.8 35 mm. camera, $45. Want comm. receiver or tape recorder. E. M. Dunham, R. 1, Allenton, Mich.

WANTED — Hi-Fi tuner, amp., record player and speaker system. State make, model, cond., and price. John Beshara, 4620 Twin City Highway, Port Arthur, Tex.

WANTED — Gonset FM tuner 152-162 Mc.; sig. tracer; Variac 5 or 7.5 amp: isolation transformer not less than 350 w.; Simpson model 660 load-check wattmeter. C. F. Ford, 316 11th St. NE, Washington 2, D. C.

FOR SALE — NRI comm. course, complete $75; Heath TS-2 TV sig. gen., l. n., $30; coin-operated radio, 6-tube, guaranteed $15. Postpaid. Brown Taylor, 1307 Vultee Blvd., Nashville, Tenn.

WANTED — DeForest 3 and 15 unit receiving sets, Honeycomb coil tuners and receivers, 1 and 2 secondary loose couplers or receiving transformers, spark apparatus and Wm. B. Duck Co. catalogs 12-16. Glen Angle, Clear Lake, S. D.

FOR SALE — Eico 425 scope, $35; Edinex 4.5 camera with flash and case, $30; 110 WS Strobe, best offer. Victor Silvestrini, 219 So. 6th St., Newark 3, N. J.

FOR SALE — Amplifier Corp of America 100GE HiFi amp. and Dongenes AM-FM tuner, 12 tubes, $140 for both or will sell separately. National SW54 receiver with instruction book, $35 FOB. Hanna Service, 3843 Wallwerth, Toledo 12, Ohio.

FOR SALE — Riders manuals, 11 thru 14, like new, $5 each FOB. Harry Hatfield, 3 Continental Place, Glen Cove, L. I., N. Y.

WANTED — Small TV, need not work, prefer 10". Will trade 2-speed disc recorder or Heath 6 w. amp. in A-1 cond. Jerry Robinson, Box 466, Davenport, Wash.

WANTED — Scott receiver chassis, not necessarily in working cond., will pay cash. John A. Kimm, 934 Judson St., Evansville 13, Ill.

FREE — Courses in radio and television repairs, exc. opportunity to learn new skills, new developments, latest technical information. Gustav Motz, Queens Evening Trade School, 47th Ave., and 37th St., Long Island City 1, N. Y.

FOR SALE — SX-71, Pentron 9T-3C, EMC No. 204 tube, battery, cond., resistance tester, Signal Corps BC-375-E transmitter. All l. n. Prefer local contact. Richard Ebeling, 33 Randolph Rd., White Plains, N. Y.

FOR SALE — All Heathkit: VTVM model V-1; BE-1 battery eliminator; T-1 sig. tracer; TS-1 TV alignment generator; Supreme E-200C sig. gen. All assembled, like new. A. F. Benedict, 638 South 4th St., Sharpsville, Pa.

FOR SALE — Riders manuals 1, 2, 5 thru 10. Best offer. Harold Tryon, 616 Sea View Dr., El Cerrito, Calif.

FOR SALE — Meissner Analyst model 9-1040 with instruction book and test probes and sig. gen., both for $50. N. Caruso, 1923 South Warnock St., Philadelphia 48, Pa.

WANTED — HQ 129 or S40 receiver; HT 9 or equivalent transmitter; BC-221 freq. meter. John Bargamian, 54 Tourtelot Ave., Warwick, R. I.

FOR SALE — Sams Photofacts 1-186, 25c each; Riders manuals 1, 5, 6, 7, $2.50 each; high voltage probe, 740 ohm, $2.98; TV interference filter SW20, $1.25. Mrs. H. Horne, 919 Wisconsin Ave., North Fond du Lac, Wis.

FOR SALE — Hamshack comprising VFX 680 Sonar Crystals, 807, 85 w., Temco Modulator, antenna coupler, meters, power supplies, tubes, keys, mike relays, all band plug-in coils, $110 or best offer. William Weingart, 201 Allen St., New York City, N. Y.

FOR SALE — Simpson model 260 multimeter-set tester, good cond., test prods, with batteries. Cost new $38, will sacrifice, best offer or $25. (Money order, register check.) Robert H. Brunke, 252 Watertown St., Newton 58, Mass.

TRADE OR SELL — Fifty type 39-44 radio tubes. Best offer. G. H. Swiska, 103 E. School St., Woonsocket, R. I.

FOR SALE — Hammarlund HQ120X, relined and in good shape, $80; 160 Amp. 220 v. AC Craftsman welder, complete with helmet, line cord, welding lines, $90. Geo. Gnandt, Wellington, Ohio.

WANTED — 7JP4 tube. Walter F. Liszewski, 1709 E. Norwich, Milwaukee 7, Wis.

TRADE — Have l. n. .22 automatic rifle with Scope Site, for Comm. receiver, tube checker, test equip. E. A. Sawyer, Box 346, Marshall, N. C.

SELL — All chrome-plated Bug, Telegraph Apparatus Co., exc. cond., $11; Sonar VFX680 with Xtals, $25. W. Stempel, 57 Byram Rd., Byram, Conn.

FOR SALE — Little used Heath scope, model 03; and sweep gen., model G3. Make offer. F. A. McGonigle, 927 Vandever Ave., Wilmington 205, Del.

WANTED — Walkie-talkie transceivers in good working cond. Joe McCaslin, 5339 21st SW, Seattle, Wash.

SELL OR SWAP — 2 record changers, $10 ea.; underdash auto radio, $12 and electronic equip. Want old hand guns, or Colts in any cond. W. W. Hackenson, 1151 High St., Westwood, Mass.

FOR SALE — Kirby fly-back tester, model 98, $30; Precision E-400 sweep gen., $100. Both like new. C. Soest, 12092 Kilbourn, Detroit 13, Mich.

SELL OR SWAP — Early radio, Telmaco, type TA2 with tubes; "Service" magazine for 1932 to 1936, all bound vols.; "Electrical Engineering" for 1950, 1951, 1952 incomplete years. Want older IRE Proc. L. Hetchler, 6101 N. 2nd St., Rockford, Ill.

WANTED — Audio equip., used Sams, Heathkit test equip., and 7" TV. Will trade components or cash. Philip Harms, 2223 Home Ave., Columbus, Ind.

FOR SALE — Brown plastic cabinet for Admiral 16" TV table model 21B1. Make offer. Unused. A. J. Tryba, 2617 So. Kolin Ave., Chicago 23, Ill.

SWAP — Hi-Fi amps, tuners, speakers, preamps., Pilot 101 transceiver, tube tester, voltmeter, for guns, rifles, pistols, shotguns, scopes, or binoculars. Bill Bockman, 400 Single Ave., Collins Park, Del.

SELL OR SWAP — Eico model 360 TV FM sweep-sig. gen. with 5 Kc. Xtal, l. n., $25; R-9-R (Millen) coil for channel 6, $10. Both FOB. P. H. Graesser, 69 Chapman St., New Britain, Conn.

SELL OR TRADE — Federal 8 mm. enlarging camera; takes 127 negatives of black and white or color 8 mm. movie frames, for Heath tube checker or other kits. D. C. Harrington, 2508-B 36th St., Los Alamos, N. M.

FOR SALE — Viking II late model, A-1 cond., homemade VFO, coax ant. relay, mike and key; N-C57 receiver S meter, complete outfit for station. G. Johnson, 1097 Park Lane, Knoxville, Iowa.

WANTED — New or used 465 Mc. short wave transmitter and receiver and Masco WF-1, or other make 2-station wireless system, inter-comm. State price and cond. Peter Shavel, 332 Maujer St., Brooklyn 6, N. Y.

FOR SALE — Instructograph and RCA Chanalyst and other radio test instruments. John McHugh, 451 East 135th St., New York 54, N. Y.

WANTED — Simpson model 476 Mirroscope 5", A-1 cond., quote low dollar in 1st letter. G. E. Howarth, 216 1st Ave. E, Oskaloosa, Iowa.

FOR SALE — Jerrold, Astatic CT-1, Regency, Anchor Boosters, $15 each, two Double Stage Anchor Boosters, $20 each. All guaranteed. Triplett 2342 RF sig. gen., up to 50 Mc., $20 or what have you for trade? Robert Pack, 513 Tayco St., Menasha, Wis.

SELL OR TRADE — Two trumpets 4½x24" aluminum and Y adapter, exc. cond. Want late model scope or VTVM, Heathkit or Eico preferred. Roy G. Humphreys, Ballard, W. Va.

FOR SALE — Eico 5" scope, model 425, completely wired, $35; Eico model 221 vacuum tube voltmeter. $25. Electronics, Inc., 229 N. Knollwood Dr., Wheaton, Ill.

WANTED — Will pay cash for a 75 w. transmitter, must be in good cond., with power supply and modulator included, for use on 80 meter band. Vess B. Tatum, Kershaw, S. C.

WANTED — Used test equip., state cond. and price. H. L. Boyer, 712 Chesterfield Rd., Apt. C, Columbus, Ohio.

WANTED — Issues of "Electronics" magazine, 1946-1952. Prefer complete years. Max Hoberman, 11 Godwin Ave., Fair Lawn, N. J.

FOR SALE — Precision E-200C sig. gen., good cond., $22.50. Jack Childs, 240 Lena Blvd., Prospect Gardens, Fort Lauderdale, Fla.

SELL OR SWAP — Meissner sig. shifter model 9-1090, A-1 cond. Trade for RME VHF-152A converter. John Cloyd, 454 So. 3rd St., Hamilton, Ohio.

SELL OR SWAP — Presto model K complete disc recorder with mike and cutting needle, $150; GI 2-speed base unit recorder. Swap for two 15" PM or Dynamic speakers. Jack Collinsworth, WLAG, LaGrange, Ga

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WANTED — RME LF-90 long wave converter (90-600 Kc.) or small long wave receiver. Charles W. Leigh, 162 Passaic St., Trenton 8, N. J.

FOR SALE — Supreme model 592 OPV push-button multimeter, $20. Jack's Radio and TV, Bedford, Iowa.

FOR SALE — Virgin Presto thermostylii, and "TV Test Instruments," second printing, by Kiver. Frank York, Box 101, St. Albans 12, N. Y.

WANTED — Hi-Fi 12" or 15" coax loudspeaker; and Weston 301 DC voltmeter, 0-50 or 0-100 — 1000 ohms per volt. State make, model, and price. Ira I. Walker, 1612 Cent., Great Falls, Mont.

FOR SALE — Eico 360K sweep gen., used very little, perf. cond., $25. Sig Salmento, 309 Richardson Ave., Utica, N. Y.

WANTED — Clean, used radio courses: Sprayberry, NRI, DeForest. State price without kits, and date. Charles E. Kinsler, Jr., 42 East Dunedin Road, Columbus 14, Ohio.

FOR SALE — Riders manuals, 6-16 incl., $75 for lot. J. Willie Guertin, 7 Fogg Ave., Biddeford, Me.

TRADE — Vols. 6, 7, 10 to 13 Riders manuals in exc. cond., for 110 v. to 6 v. converter. Dennis TV, 111 N. Main St., Henderson, Tex.

SWAP — Man's 21-Jewel Bulova watch, exc. cond., one year guarantee, for radio or TV test equip. Julius Bernstein, 3-10 31st St., Fair Lawn, N. J.

SELL OR TRADE — GI R90L 2-speed disc recorder and playback basic assembly in carrying case for good 3-speed record changer. Have NRI 88 professional sig. gen., NRI tester less batteries. Want used 7" or 10" TV. Ken Bulgrien, Grantham, Pa.

WANTED — Simpson model 220 Roto Ranger tube checker. State cond., and price. C. H. Rieth, RD 4, Troy, N. Y.

FOR SALE — Precision 920 tube and set tester, $60; Supreme 576 sig. gen., $40; Weston 267 0-100 Mil. meter, $5; RCA, Philco, Zenith, Supreme Service manuals, 1928-1942. R. J. Garand, 1902 Belmont Ave., Chicago 13, Ill.

WANTED — Late model Heathkit scope and sweep gen. (in kit or wired form). State price and cond. E. A. Hudson, 113 Golf Ave., Mt. Rt. 7, Ellwood City, Pa.

SWAP — About 25 receiving tubes — 12AY7 1. n., for Heathkit sig. tracer or condenser checker. Roy Goodwin, North Drive, Rt. 1, Ben Hill, Ga.

WANTED — GE audio generators, YGS2 sine wave, YGL1 square wave. Bill Williams, 1910 W. Walnut St., Milwaukee, Wis.

WANTED — Late model Heath or Hickok tube checker. State model and make. Must be reasonable. Also want square wave generator. Robert Pack, 513 Tayco St., Menasha, Wis.

WANTED — 14" to 16' TV receiver in good shape, also 16 mm. art film. Have test instruments, amps., and cash. John Arnold, Box 84, Bluffs, Ill.

FOR SALE — Speakers; crossover networks; audio Hi-Fi equip.; meters. Write for list. S. Friedland, 140 - 35 Franklin Ave., Flushing 55, N. Y.

SELL OR TRADE — Geiger Mueller tube capable of detecting gamma beta and alpha radiation, 900 v., plateau, never used. P.N.T. Television Service, 4230 Kensington Ave., Philadelphia 24, Pa.

WANTED — 2 and 6 meter crystal controlled converters. Harry Williams, Pleasant Hill, Mo.

FOR SALE — Heathkit tube checker with picture tube test adapter, $27.50; Heathkit sig. gen., $12. B. Soroka, 5341 Cordelia Ave., Baltimore 15, Md.

SELL OR TRADE — QST '31 - '48; Sear's radio catalog '25; Experimenter 25; Radio News Amateur Handbook '27; Radio Craft '29; Radio News May '30; Electronics '36 - '37; Radio News '46 - '50. G. Brinzendine, 1001 Merritt St., Old Hickory, Tenn.

WANT — S-36, 36A, or S-37 receiver for cash or swap ham, TV, etc., equip. C. T. Fernandez, 81 Warren St., Box 19, Boston, Mass.

FOR SALE — VFO controlled all-band 100 w. phone-CW transmitter; Home-brew ham-band double conversion superhet with built-in selectojet. Make offer. R. Mendelson, 105 Leslie St., Newark 8, N. J.

FOR SALE — RCP model 777A sig. tracer, l. n., $20; Simpson volt-ohm milliammeter, model 260, 20,000 ohms per volt, l. n., $25; radio and TV books. Thomas Byrne, 331 Calhoun Ave., Bronx 61, N. Y.

CLOSE OUT SALE — Passing of proprietor requires liquidating complete equipment modern service shop. Sams bound vols., Photofacts, 1 thru 15, tube tester, Heathkit scope, voltmeter, etc. No reasonable offer refused. Send for detailed list. Mrs. H. A. Stockwell, Box 252, Hartington, Neb.

SELLING OUT — Truckload of surplus radio gear. Send for list. Want real bargain in TV test gear. K. H. Stello, 823 Chillum Rd., Hyattsville, Md.

FOR SALE — National NC-183, l. n., $180; National NC-108 FM receiver for studio monitor, $65; Gonset 2-meter mobile converter, $30; Craftsman RC-8 FM-AM tuner, good cond., $65. J. R. Halchak, 10 True St., Everett, Mass.

FOR SALE — BC-221-E, Pilotuner, 522 transmitter, VHF ARC-5 transmitter, two Link model 695-B transmitter - receivers (7-tube, 30 Mc, batt. operated, portable pack sets with shoulder straps). Ardmore Radio-Television Service, 114 Lockland Ave., Winston-Salem, N. C.

FOR SALE — Riders 1 - 11; 155 Traceometer; Hickok 180 gen.-output meter. Frank Beckman, 2442 76th Ave., Oakland 5, Calif.

FOR SALE — Back issues Radio-TV News, QST, CQ, RSGB. BC-348Q, BC-696, BC-459, TU-10B, I-176 tube checker, I-177 VOM. Pair EE-8, T27, tubes. J. M. Sulak, RD 2, Box 242, Wellsburg, W. Va.

FOR SALE OR TRADE — RME HF 10-20 converter covering 10, 11, 15, and 20 meters. Surplus tube tester. Both in exc. cond. Make offer. J. W. Stonecipher, 1610 W. John St., Champaign, Ill.

WANT — Hickok 288X. Have for sale l. n. Bendix Par-70B broadcast and range with loop connection aircraft receiver. H. Cooper, Park Ridge, N. J.

SALE OR TRADE — Model 721 Remington 30-06 guaranteed l. n., for radio service instruments or good 35 mm. miniature camera. J. William Bleau, Jr., Meadow Creek, W. Va.

FOR SALE — Meissner model 8C FM tuner, very good cond., in cabinet, $51; C-D 110R10 DC to AC inverter, 150 w., $23: COD. Frank Cudlin, 1149 Tiffany St., Bronx, N. Y.

FOR SALE — Motor-gen. input 230 v. DC, 5.8 amps., output 2000 v. DC, .2 amps, and 550 v. DC, .3 amps. Best offer. J. H. Walker, Jr., 27 River Rd., Warwick, Va.

FOR SALE — Portable 10", 78 and 33⅓ disc recorder, sapphire cutting and playback needles, exc. cond., $45; electric steel guitar with case and amp., $45. Both FOB. E. L. Grimshaw, 174 Water St., No. Andover, Mass.

SWAP — All for tape recorder: SCR522 with 110 v. AC power supply, McElroy FU40 50 w. transmitter-exciter, 750 v. 250 Ma., 250 v. 100 Ma. power supply, and 540 v. 500 Ma., 250 v. 100 Ma. power supply. J. L. Smith, 7130 Conley St., Houston, Tex.

SERVICE — Instrument kit wiring, reasonable charges. Have Heath T-2 sig. tracer and test speaker, perf. cond., will exchange for T-3 tracer in kit form. Heath V-6 VTVM, perf., $35. C. W. Chastain, 228 Timber Lane, Memphis, Tenn.

FOR SALE — Hickok oscillograph, model 505A, perf. working order. Best offer. L. L. Merrithew, 1162-4 River St., Hyde Park 36, Mass.

WANTED — NRI servicing courses texts in good cond. State price. Harlan Rosenblatt, 316 North 50 St., Omaha 3, Neb.

SELL OR TRADE — Supreme tube tester, $25; Tone camera and case, $8; Finco-Co-Lateral TV antenna, model 400, all channel, 4-bay, $30. Alex Poeh, Box 174, Dillonvale, Ohio.

SELL OR SWAP — 1/8 HP motor, 110 v. AC, 5 HP outboard, all channel all direction antenna with 100' 4 conductor lead in, 3 portables. Want UHF converters, VHF boosters or TV tubes. Sam Nester, Van Meter, Pa.

FOR SALE — Transmitter, fully metered, 5' rack and panel, all bands 160 to 2 meters, with 829-B in final, driven by Sonar model VFX-680 with 75 w. phone output. Will ship. Al Blaumelt, Box 37, Fort Montgomery, N. Y.

FOR SALE — National NC-100 ASD receiver and speaker, $75; RCA 10 meter mobile police transmitter with dynamotor. H. Newman, 91 Falmouth Pl., Albertson, L. I., N. Y.

SELL OR TRADE — Super Pro SP400SX, 40' steel tower, Link 50 w. mobile transmitters, quantities of ham equip. Want new HRO or HQ140, etc. Staley, 2045 Springlake, NW, Atlanta, Ga.

FOR SALE — Philco 33⅓ RPM Columbia LP record player, in plastic cabinet with lid, l. n., list $29.95; Regency RC600 UHF converters, list $49.95. Make offer. Bud's Radio and Television Service, 5912 Hampton Ave., St. Louis, Mo.

WANTED — Several 814 type tubes. Have radio gear and parts to trade. Antone Oliveira, 94 Potomska St., New Bedford, Mass.

SWAP — Two WE KS 5950-L2 synchro generators in orig. cartons. Want 110 v. AC 1 Kw. gen. or tube tester. E. M. Johnson, Box 162, Fishkill, N. Y.

SELL OR SWAP — Two-way inter-com in good working order, for 10" or 12" TV in good working order. W. W. Carter, 3119 4th Ave., Chattanooga, Tenn.

FOR SALE — Gerrard changer, model RC60, l. n., 78 RPM, GE Reluctance pickup, $27. Wide selection of records in good cond., reasonable. Vincent Pellettieri, 5523 31st Ave., Woodside 77, L. I., N. Y.

SELL OR SWAP — Meissner 9-1065 comb. radio, PA system, 2-speed disc recorder and phono. Best offer or swap for equivalent value camera or optical equip. Pat J. Sidari, 220 N. Main St., Lodi, N. J.

WANTED — All channel UHF converter. Prefer RCA, Regency, or Mallory. Must be reasonable. State type, cond,, and price. John R. Potter, 112 Paul St., Sayre, Pa.

SELL OR TRADE — Used Kellogg radio chassis in complete working order. Tube lineup: 3-24, 3-27, 2-50, 2-81. Want 630 type TV chassis in working cond., or what have you? Maurice Bobholz, Theresa, Wis.

WANTED — 6N4 UHF triode transmitting-receiving miniature tube, at reasonable price. Charles Knowlton, Warren St., Upton, Mass.

FOR SALE — RCA 45 RPM automatic changer; Motorola battery portable radio, needs slight repair; Webster-Chicago 78 RPM intermix, automatic turn-off. W. J. Gartner, 117 W. Franklin St., Wheaton, Ill.

WANTED — Sams Photofacts, 10 to 129 incl. Send list of sets, cond., and price. Five Points Radio and TV, Box 111, Hampton, S. C.

WANTED — Power transformer for Zenith radio, model 411. Gregory H. Swiska, 109 E. School St., Woonsocket, R. I.

FOR SALE — Simpson Genescope, model 480, FM, TV, exc. cond. Jack B. Hombs, 4328 N. Garrison Ave., Tulsa, Okla.

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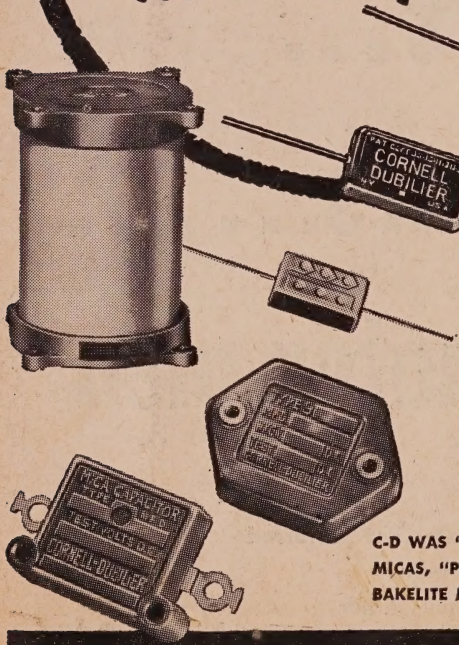

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